Copy for the Elected Office (EO/US) PCT/FI00/00809

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

SEPPO LAINE OY
Itämerenkatu 3 B
FIN-00180 Helsinki
FINLANDE

Date of mailing (day/month/year) 12 June 2001 (12.06.01)	
Applicant's or agent's file reference VAL 222 PCT	**IMPORTANT NOTIFICATION**
International application No. PCT/FI00/00809	**International filing date** (day/month/year) 21 September 2000 (21.09.00)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address	State of Nationality	State of Residence
VALMET CORPORATION Fabianinkatu 9 A FIN-00130 Helsinki Finland	FI	FI
	Telephone No. +358-20 484 100	
	Facsimile No. +358-20 484 101	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address	State of Nationality	State of Residence
METSO PAPER, INC. Fabianinkatu 9 A FIN-00130 Helsinki Finland	FI	FI
	Telephone No. +358-20 484 100	
	Facsimile No. +358-20 484 101	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer F. Baechler
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/306 (March 1994) 004082965

Recd on 5 MAR 02

What is claimed is:

1. Calender for calendering a web of paper or board, the calender comprising

   - a top roll (1) and a bottom roll (2), both of the rolls being of the variable-crown type,

   - at least one intermediate roll (3) of an intermediate roll stack adapted between said top roll (1) and said bottom roll (2) in a disposition allowing the superimposed rolls (1, 2, 3) of the stack to be brought into a nip contact with each other during calendering, and

   - support means (4, 5) for mounting said rolls (1, 2, 3) to the frame (6) of the calender or to guides (7) mounted on said frame (6),

   c h a r a c t e r i z e d by actuator means (9, 19) adapted between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips and/or between the bearing blocks (4) of said rolls so as to accomplish the relief of nip loading imposed by the weight of said intermediate rolls (3) and the auxiliary means connected thereto.

2. Calender according to claim 1, c h a r a c t e r - i z e d in that said actuator means is a spring (9).

3. Calender according to claim 1 or 2, c h a r a c -

t e r i z e d in that said actuator means is a hydraulic cylinder (19).

4. Calender according to any one of foregoing claims 1-3, c h a r a c t e r i z e d in that said actuator means are adapted to function between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips.

5. Calender according to any one of foregoing claims 1-4, c h a r a c t e r i z e d in that said actuator means are adapted to function between the bearing blocks (4) of said superimposed rolls (1, 2, 3) forming said nips.

6. Calender according to claim 3, c h a r a c t e r - i z e d in that said mount (5) includes the cylinder portion of said hydraulic cylinder (19) with the hydraulic channels thereof.

7. Calender according to claim 3 or 6, c h a r a c - t e r i z e d in that said bearing block (4) includes the cylinder portion of said hydraulic cylinder (19) with the hydraulic channels thereof.

8. Method for calendering a web of paper or board, the method comprising the steps of

- passing the web to be calendered via nips formed by a variable-crown top roll (1) and a variable-crown bottom roll (2), as well as at least one intermediate roll (3) of an inter-

mediate roll set placed between said rolls,

c h a r a c t e r i z e d in that

- the nip loading imposed by the weight of said intermediate rolls (3) and the auxiliary means connected thereto is relieved by actuator means (9, 19) adapted between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips and/or between the bearing blocks (4) of said rolls.

9. Method according to claim 8, c h a r a c t e r - i z e d in that said actuator means (9, 19) serve to accomplish an at least essentially complete relief of the nip loading imposed by the weight of said intermediate rolls (3) and auxiliary devices connected thereto.

PCT REQUEST VAL 222 PCT

Original (for **SUBMISSION**) - printed on 21.09.2000 09:29:04 AM

0	**For receiving Office use only**	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	**Form - PCT/RO/101 PCT Request**	
0-4-1	Prepared using	PCT-EASY Version 2.91 (updated 01.07.2000)
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	National Board of Patents and Registration (Finland) (RO/FI)
0-7	**Applicant's or agent's file reference**	VAL 222 PCT
I	**Title of invention**	CALENDER
II	**Applicant**	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	VALMET CORPORATION
II-5	Address:	Fabianinkatu 9 A FIN-00130 Helsinki Finland
II-6	State of nationality	FI
II-7	State of residence	FI
II-8	Telephone No.	+358-20 484 100
II-9	Facsimile No.	+358-20 484 101
III-1	**Applicant and/or inventor**	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	VILJANMAA, Mika
III-1-5	Address:	Kotinummenkuja 2 F 25 FIN-00700 Helsinki Finland
III-1-6	State of nationality	FI
III-1-7	State of residence	FI

PCT REQUEST VAL 222 PCT

Original (for **SUBMISSION**) - printed on 21.09.2000 09:29:04 AM

IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	SEPPO LAINE OY
IV-1-2	Address:	Itämerenkatu 3 B FIN-00180 Helsinki Finland
IV-1-3	Telephone No.	+358-9-68 59 560
IV-1-4	Facsimile No.	+358-9-68 595 610
IV-1-5	e-mail	seppo.laine@selpat.fi
V	**Designation of States**	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT (patent and utility model) AU AZ BA BB BG BR BY BZ CA CH&LI CN CR CU CZ (patent and utility model) DE (patent and utility model) DK (patent and utility model) DM DZ EE (patent and utility model) ES FI (patent and utility model) GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK (patent and utility model) SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

PCT REQUEST VAL 222 PCT

Original (for **SUBMISSION**) - printed on 21.09.2000 09:29:04 AM

V-5	**Precautionary Designation Statement** In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.		
V-6	**Exclusion(s) from precautionary designations**	NONE	
VI-1	**Priority claim of earlier national application**		
VI-1-1	Filing date	24 September 1999 (24.09.1999)	
VI-1-2	Number	19992057	
VI-1-3	Country	FI	
VI-2	**Priority document request** The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	**International Searching Authority Chosen**	Swedish Patent Office (ISA/SE)	
VIII	**Check list**	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	6	-
VIII-3	Claims	3	-
VIII-4	Abstract	1	val222pct.txt
VIII-5	Drawings	2	-
VIII-7	TOTAL	16	
	Accompanying Items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-9	Separate signed power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Copy of official action	-
VIII-18	**Figure of the drawings which should accompany the abstract**	1	
VIII-19	**Language of filing of the international application**	Finnish	
IX-1	**Signature of applicant or agent**		
IX-1-1	Name	SEPPO LAINE OY	
IX-1-2	Name of signatory	Simo Hovi	
IX-1-3	Capacity	Patent Agent	

PCT REQUEST VAL 222 PCT

Original (for **SUBMISSION**) - printed on 21.09.2000 09:29:04 AM

FOR RECEIVING OFFICE USE ONLY

10-1	**Date of actual receipt of the purported international application**	
10-2	**Drawings:**	
10-2-1	Received	
10-2-2	Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/SE
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

SEPPO LAINE OY
Itämerenkatu 3 B
FIN-00180 Helsinki
FINLANDE

Date of mailing (day/month/year)
12 June 2001 (12.06.01)

Applicant's or agent's file reference
VAL 222 PCT

IMPORTANT NOTIFICATION

International application No.
PCT/FI00/00809

International filing date (day/month/year)
21 September 2000 (21.09.00)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address
VALMET CORPORATION
Fabianinkatu 9 A
FIN-00130 Helsinki
Finland

State of Nationality: FI
State of Residence: FI
Telephone No.: +358-20 484 100
Facsimile No.: +358-20 484 101
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address
METSO PAPER, INC.
Fabianinkatu 9 A
FIN-00130 Helsinki
Finland

State of Nationality: FI
State of Residence: FI
Telephone No.: +358-20 484 100
Facsimile No.: +358-20 484 101
Teleprinter No.:

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[X] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
F. Baechler

Telephone No.: (41-22) 338.83.38

The demand must be filed directly with the competent International Preliminary Examining Authority. If two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ SE

PCT

CHAPTER II

PTO/PCT Rec'd 15 MAR 2002

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION

Applicant's or agent's file reference: VAL 222 PCT

International application No.	International filing date *(day/month/year)*	(Earliest) Priority date *(day/month/year)*
PCT/FI00/00809	(21.9.2000) 21 September 2000	(24.9.1999) 24 September 1999

Title of invention: Calender

Box No. II APPLICANT(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

VALMET CORPORATION
Fabianinkatu 9 A
FIN-00130 HELSINKI
FINLAND

Telephone No.

Facsimile No.

Teleprinter No.

Applicant's registration No. with the Office

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
Finland	Finland

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

VILJANMAA, Mika
Kotinummenkuja 2 F 25
FIN-00700 HELSINKI
FINLAND

State *(that is, country)* of nationality:	State *(that is, country)* of residence:
Finland	Finland

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:	State *(that is, country)* of residence:

☐ Further applicants are indicated on a continuation sheet.

International application No.
PCT/FI00/00809

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is [X] agent [ ] common representative

and [X] has been appointed earlier and represents the applicant(s) also for international preliminary examination.

[ ] is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

[ ] is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

SEPPO LAINE OY
Itämerekatu 3 B
FIN-00180 HELSINKI
FINLAND

Telephone No.
+ 358-9-68 59 560

Facsimile No.
+ 358-9-68 595 610

Teleprinter No.

Agent's registration No. with the Office

[ ] **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination **to start on the basis of:**

[X] the international application as originally filed

the description [ ] as originally filed
[ ] as amended under Article 34

the claims [ ] as originally filed
[ ] as amended under Article 19 (together with any accompanying statement)
[ ] as amended under Article 34

the drawings [ ] as originally filed
[ ] as amended under Article 34

2. [ ] The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. [ ] The applicant wishes the start of the international preliminary examination **to be postponed** until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

[ ] which is the language in which the international application was filed.

[ ] which is the language of a translation furnished for the purposes of international search.

[X] which is the language of publication of the international application.

[ ] which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby **elects all eligible States** *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes **not to elect:**

Sheet No. 3..

International application No.
PCT/FI00/00809

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:			For International Preliminary Examining Authority use only: received	not received
1. translation of international application	:	sheets	☐	☐
2. amendments under Article 34	:	sheets	☐	☐
3. copy (or, where required, translation) of amendments under Article 19	:	sheets	☐	☐
4. copy (or, where required, translation) of statement under Article 19	:	sheets	☐	☐
5. letter	:	sheets	☐	☐
6. other *(specify)*	:	sheets	☐	☐

The demand is also accompanied by the item(s) marked below:

1. [X] fee calculation sheet
2. ☐ original separate power of attorney
3. ☐ original general power of attorney
4. ☐ copy of general power of attorney; reference number, if any:
5. ☐ statement explaining lack of signature
6. ☐ sequence listing in computer readable form
7. ☐ other *(specify)*:

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

Seppo Laine Oy

for the Applicant

Jyrki Nissinen

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.
4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

SEPPO LAINE
PATENTTITOIMISTO

PATENT AND TRADEMARK AGENTS
EUROPEAN PATENT ATTORNEYS

SEPPO E. LAINE
CHRISTOFFER SUNDMAN
JARI LIPSANEN
TERHO OVI
SISKO KNUTH-LEHTOLA
JARKKO TIILIKAINEN
JYRKI NISSINEN
SOLVEIG STRÖMSHOLM

Patent- och registreringsverket
Box 5055
S-102 42 Stockholm
Sverige

29 October 2001

VIITTEENNE:
YOUR REFERENCE:

VIITTEEMME:
OUR REFERENCE:

VAL 222 PCT

TELEFAX AND MAIL
(6 pages)

INTERNATIONAL PATENT APPLICATION NO. PCT/FI00/00809,
in the name of METSO PAPER, Inc. et al

Dear Sirs,

Referring to the written opinion of 29 August 2001 we respectfully submit the following:

Amendments:

We enclose new pages 8-10, which replace pages 8-10 presently on file.

New independent claims 1 and 8 replace the original independent claims 1 and 8.

New claim 1 differs from the original claim in that:

- The third part of the preamble "support means (4, 5) for mounting said rolls (1, 2, 3) to the frame (6) of the calender or to guides (7) mounted on said frame (6)" has been replaced with the features "bearing blocks (4) in which said rolls (1, 2, 3) are mounted" and "mounts (5) to which the bearing blocks (4) of the intermediate rolls (3) are connected and which are slidably connected to the calender frame (6)".

SEPPO LAINE OY
PL 339 P.O.B. 339
00181 HELSINKI, FINLAND

TOIMISTO-OFFICE
ITÄMERENKATU 3 B
00180 HELSINKI, FINLAND

SUOMEN PATENTTIASIAMIESYHDISTYS RY:N JÄSEN
MEMBER OF FICPI
MEMBER OF EPI
OHIM REPRESENTATIVE

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REG. No. 342.419

PANKKI BANK
MERITA (SW: MRITFIHH)
215318-60138

POSTISIIRTO POSTGIRO
800018-1108516

New claim 8 differs from the original claim in that:

- The feature "said rolls (1, 2, 3) being mounted in a bearing blocks (4) and the bearing blocks (4) of the intermediate roll (3) being slidably connected to the calender frame (6)" has been added to preamble of the claim.

The amendments are based on the subject matter on page 5 in lines 4 to 7 and on page 7 in lines 23 to 28 of the description.

No new material has been added.

Patentability:

Cited document D1, US 5438920, discloses a calender in which each intermediate roll is mounted from both ends in bearing housing. To the bearing housing there is connected an arm whose other end is pivotally connected to the frame of the calender by means of articulated joints. A load relief device is arranged between the arm and the frame of the calender. When the calender is running, the arms pivot around the articulated joints, whereby the distance and the angle between the superimposed arms also change. In order to apply a constant relief to the nip load in D1, the other end of the relief device must be connected to the stable part i.e. to the frame of the calender. In D1 the relief device can not be adapted between the superimposed arms or bearing housings as in the invention because the nip load would fluctuate substantially due to the pivotal movement of the arms.

In the invention the mounts of the intermediate rolls are slidably connected to the calender frame, whereby the distance and angle between the superimposed mounts or bearing housings remain almost constant, thus making it possible to adapt the load relief device between the mounts or the bearing housings of the superimposed rolls.

Cited document D2, DE 1150272, discloses a calender in which both ends of the rolls are mounted in bearing housings. To the each bearing housing there is connected an arm, which is pivotally connected to the support part which is attached to the calender frame. The relief device is adapted between the superimposed arms. When the nip load is relieved by the relief device, the arm pivots around the articulated joint, whereby the rolls forming the nip move laterally in relation to each other. Therefore the contact point of the rolls also moves to other location, which effects on the nip load applied to the web. As in D1, also in D2 the distance and the angle between the superimposed arms also change due to pivotal movement of the arms, thus causing fluctuations to the nip load. The lateral movement of the intermediate rolls makes the use of variable-crown top and bottom rolls ineffective.

In the invention the mounts of the intermediate rolls are slidably connected to the guides on the calender frame and there are no articulated joints between mounts and the frame. When the nip load is relieved by the actuator means, the contact point between superimposed rolls does not change. Also the distance and the angle between superimposed rolls remain almost constant. For these reasons the nip load does not fluctuate as much as in the calender disclosed in D2 and the variable-crown type of top and bottom rolls can be used.

Because any of the cited documents does not disclose the combination in which mounts of the calender are slidably connected to calender frame and the nip loading is relieved by actuator means adapted between superimposed bearing housings and/or mounts, it would be impossible for a person skilled in the art to end up to our invention on the bases of the cited references. Therefore we are of the opinion that the invention defined in new independent claims, in addition to being novel, also involves a clear inventive step.

Yours faithfully,
Seppo Laine Oy

Jyrki Nissinen

Encl.: new pages 8 -10

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

12

Applicant's or agent's file reference VAL 222 PCT	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FI00/00809	International filing date *(day/month/year)* 21.09.2000	Priority date *(day/month/year)* 24.09.1999
International Patent Classification (IPC) or national classification and IPC7 D 21 G 1/00		
Applicant METSO PAPER INC. et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23.04.2001	07.12.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Telex 17978 PATOREG-S Facsimile No. 08-667 72 88	Authorized officer Erika Westberg/ELY Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FI00/00809

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed

☒ the description:
pages 1-6 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

☒ the claims:
pages _____ , as originally filed
pages _____ , as amended (together with any statement) under article 19
pages _____ , filed with the demand
pages 8-10 , filed with the letter of 29.10.2001

☒ the drawings:
pages 2 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

☐ the sequence listing part of the description:
pages _____ , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language English which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☒ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FI00/00809

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-9	YES
	Claims		NO
Inventive step (IS)	Claims	1-9	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-9	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The following documents are cited in the International Search Report:
D1: US 5438920
D2: DE 1150272
D3: EP 0242783

The cited documents represent background art.

D1 discloses a calender for calendering of a paper or board web, in which the web is passed through nips formed by a variable-crown upper roll, a variable-crown lower roll, and by two or more intermediate rolls arranged between the upper and lower rolls. The rolls are mounted in bearing housings (131, 141, 151, 161), mounted on arms (152) which are connected to the frame (11) of the calender. The bearing housings and the arms are considered to correspond to the support means according to the invention. Relief means, comprising one relief device connected to each of the intermediate rolls, are arranged to relieve the mass of the intermediate rolls and the auxiliary equipment (column 5, lines 49-61). The relief devices are considered to correspond to the actuator means according to the invention. The relief devices can be hydraulic cylinders (column 9, lines 61-68).

D2 describes a calender for calendering a paper web, comprising a stack of rolls. Relief devices, comprising a clamping bolt and a spring, are arranged between the mounts (6) of the rolls (column 4, lines 21-65). The object of D2 is to avoid very high pressures caused by the upper rolls.

.../...

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V.

None of the cited documents discloses the combination in which mounts of the calender are slidably connected to the calender frame and the nip loading is relieved by actuator means adapted between superimposed bearing housings and /or mounts.

Therefore, the invention defined in claims 1-9 is novel and is considered to involve an inventive step. It is also considered to be industrially applicable.

What is claimed is:

1. Calender for calendering a web of paper or board, the calender comprising

- a top roll (1) and a bottom roll (2), both of the rolls being of the variable-crown type,

- at least one intermediate roll (3) of an intermediate roll stack adapted between said top roll (1) and said bottom roll (2) in a disposition allowing the superimposed rolls (1, 2, 3) of the stack to be brought into a nip contact with each other during calendering, and

- bearing blocks (4) in which said rolls (1, 2, 3) are mounted, and

- mounts (5) to which the bearing blocks (4) of the intermediate roll (3) are connected and which are slidably connected to the guides (7) adapted to the calender frame (6),

c h a r a c t e r i z e d by actuator means (9, 19) adapted between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips and/or between the bearing blocks (4) of said rolls so as to accomplish the relief of nip loading imposed by the weight of said intermediate rolls (3) and the auxiliary means connected thereto.

2. Calender according to claim 1, c h a r a c t e r - i z e d in that said actuator means is a spring (9).

3. Calender according to claim 1 or 2, c h a r a c - t e r i z e d in that said actuator means is a hydraulic cylinder (19).

4. Calender according to any one of foregoing claims 1-3, c h a r a c t e r i z e d in that said actuator means are adapted to function between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips.

5. Calender according to any one of foregoing claims 1-4, c h a r a c t e r i z e d in that said actuator means are adapted to function between the bearing blocks (4) of said superimposed rolls (1, 2, 3) forming said nips.

6. Calender according to claim 3, c h a r a c t e r - i z e d in that said mount (5) includes the cylinder portion of said hydraulic cylinder (19) with the hydraulic channels thereof.

7. Calender according to claim 3 or 6, c h a r a c - t e r i z e d in that said bearing block (4) includes the cylinder portion of said hydraulic cylinder (19) with the hydraulic channels thereof.

8. Method for calendering a web of paper or board, the method comprising the steps of

- passing the web to be calendered via nips formed by a variable-crown top roll (1) and a variable-crown bottom roll (2), as well as at least one intermediate roll (3) of an intermediate roll set placed between said rolls, said rolls (1, 2, 3) being mounted in a bearing blocks (4) and the bearing blocks (4) of the

intermediate roll (3) being slidably connected to the calender frame (6),

c h a r a c t e r i z e d in that

- the nip loading imposed by the weight of said intermediate rolls (3) and the auxiliary means connected thereto is relieved by actuator means (9, 19) adapted between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips and/or between the bearing blocks (4) of said rolls.

9. Method according to claim 8, c h a r a c t e r - i z e d in that said actuator means (9, 19) serve to accomplish an at least essentially complete relief of the nip loading imposed by the weight of said intermediate rolls (3) and auxiliary devices connected thereto.

12878

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PCT REQUEST

VAL 222 PCT

Original (for **SUBMISSION**) - printed on 21.09.2000 09:29:04 AM

0 0-1	**For receiving Office use only** International Application No.	PCT/FI 0 0 / 0 0 8 0 9
0-2	International Filing Date	2 1 SEP 2000 (2 1. 09. 00)
0-3	Name of receiving Office and "PCT International Application"	The Finnish Patent Office PCT International Application
0-4 0-4-1	**Form - PCT/RO/101 PCT Request** Prepared using	PCT-EASY Version 2.91 (updated 01.07.2000)
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	National Board of Patents and Registration (Finland) (RO/FI)
0-7	**Applicant's or agent's file reference**	VAL 222 PCT
I	**Title of invention**	CALENDER
II II-1 II-2 II-4 II-5 II-6 II-7 II-8 II-9	**Applicant** This person is: Applicant for Name Address: State of nationality State of residence Telephone No. Facsimile No.	applicant only all designated States except US VALMET CORPORATION Fabianinkatu 9 A FIN-00130 Helsinki Finland FI FI +358-20 484 100 +358-20 484 101
III-1 III-1-1 III-1-2 III-1-4 III-1-5 III-1-6 III-1-7	**Applicant and/or inventor** This person is: Applicant for Name (LAST, First) Address: State of nationality State of residence	applicant and inventor US only VILJANMAA, Mika Kotinummenkuja 2 F 25 FIN-00700 Helsinki Finland FI FI

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IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
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IV-1-5	e-mail	seppo.laine@selpat.fi
V	**Designation of States**	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT (patent and utility model) AU AZ BA BB BG BR BY BZ CA CH&LI CN CR CU CZ (patent and utility model) DE (patent and utility model) DK (patent and utility model) DM DZ EE (patent and utility model) ES FI (patent and utility model) GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK (patent and utility model) SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

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V-5	**Precautionary Designation Statement** In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.		
V-6	**Exclusion(s) from precautionary designations**	NONE	
VI-1	**Priority claim of earlier national application**		
VI-1-1	Filing date	24 September 1999 (24.09.1999)	
VI-1-2	Number	19992057	
VI-1-3	Country	FI	
VI-2	**Priority document request** The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	**International Searching Authority Chosen**	Swedish Patent Office (ISA/SE)	
VIII	**Check list**	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	6	-
VIII-3	Claims	3	-
VIII-4	Abstract	1	val222pct.txt
VIII-5	Drawings	2	-
VIII-7	TOTAL	16	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-9	Separate signed power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Copy of official action	-
VIII-18	**Figure of the drawings which should accompany the abstract**	1	
VIII-19	**Language of filing of the international application**	Finnish	
IX-1	**Signature of applicant or agent**		
IX-1-1	Name	SEPPO LAINE OY	
IX-1-2	Name of signatory	Simo Hovi	
IX-1-3	Capacity	Patent Agent	

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10-1	**Date of actual receipt of the purported international application**	21 SEP 2000 (21.09.00)
10-2	**Drawings:**	
10-2-1	Received	
10-2-2	Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/SE
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	06 OCT 2000 (06.10.00)

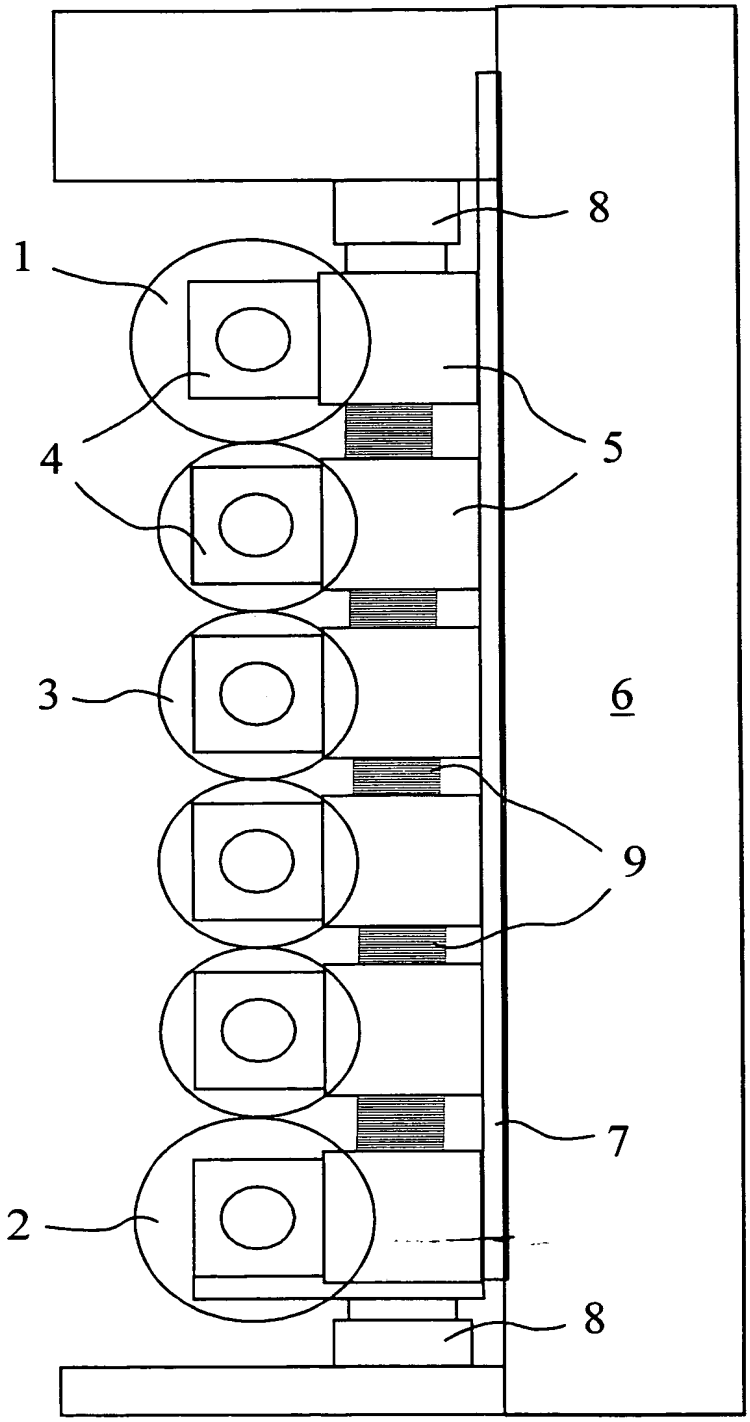

Fig. 1

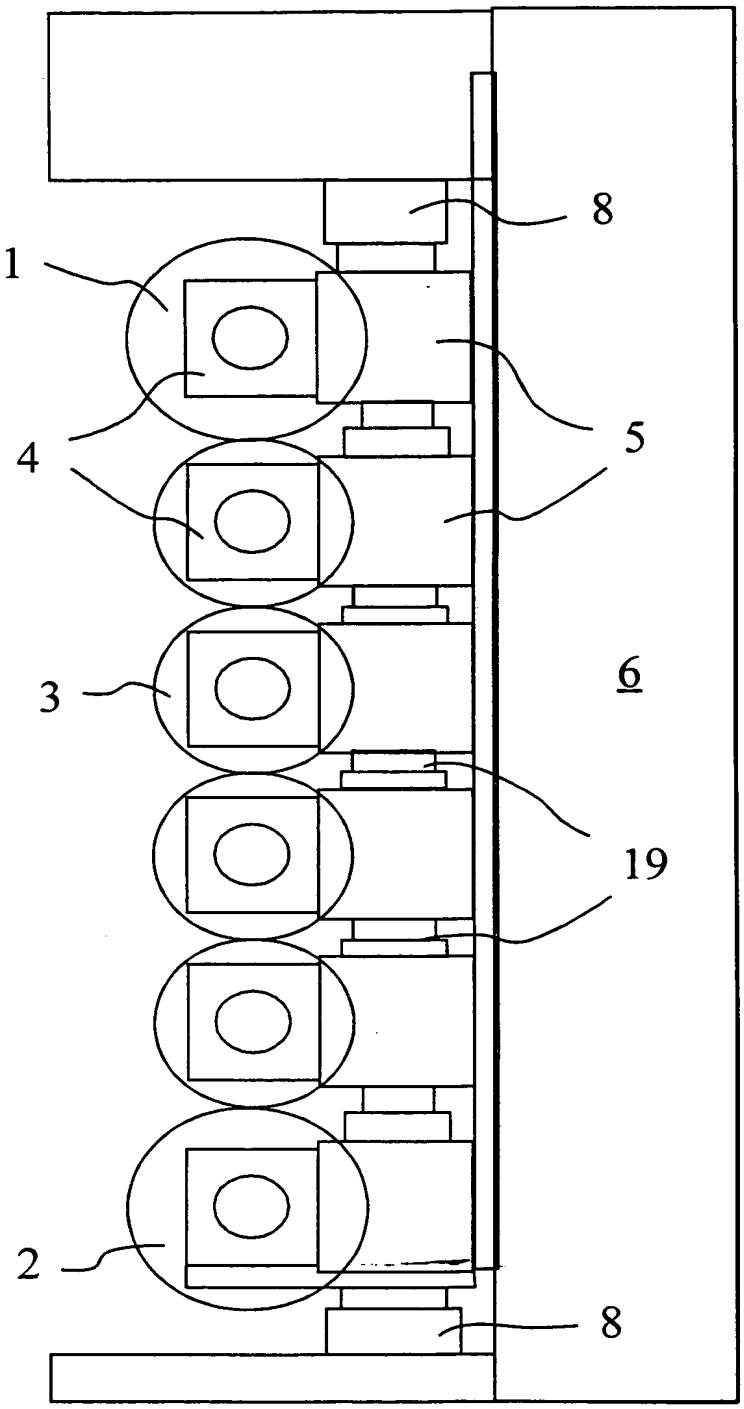

Fig. 2

Kalanteri

Tämän keksinnön kohteina ovat patenttivaatimuksen 1 johdannon mukainen kalanteri ja patenttivaatimuksen 8 johdannon mukainen kalanterointimenetelmä.

Paperi- tai kartonkirainan pintaa tasoitetaan ja kiillotetaan monitelakalanterissa, jossa on päällekkäin kalanterin runkoon kiinnitettyjä teloja, jotka ovat nippikosketuksessa keskenään. Telapino muodostetaan ylä- ja alatelasta sekä ainakin yhdestä näiden väliin sijoitetusta välitelasta. Telaryhmä puristetaan kokoon kuormitusteloina toimivilla ylä- ja alateloilla tai pelkästään alatelalla riittävän nippikuorman aikaansaamiseksi. Kalanteroitaessa raina kulkee päällekkäisten telojen muodostamien kalanterinippien läpi.

Telaston telat on laakeroitu laakeripesiin, jotka tavallisesti on kiinnitetty kantaosiin. Kantaosat on edelleen liukuvasti kiinnitetty kalanterin rungossa oleviin pystysuuntaisiin johteisiin. Tavanomaisessa superkalanterissa kantaosat on lisäksi sovitettu kalanterin runkoon kiinnitettyihin pystysuuntaisiin nostokaroille. Telaston ollessa auki kantaosien paikoitus pystysuunnassa hoidetaan nostokarojen ja niillä olevien karamuttereiden avulla. Kunkin telan kantaosat makaavat karamuttereiden päällä, jolloin kuormittamattomassa tilassa telasto roikkuu nostokarojen varassa. Telaston laakeripesiä ja niihin kiinnitettyjä teloja voidaan liikuttaa pystysuunnassa suhteessa kantaosiin.

Monitelakalanterin telastossa on useita teloja päällekkäin, jolloin telojen massasta nippeihin aiheutuva viivakuormitus kasvaa ylänipiltä alanippiä kohden mentäessä, jolloin alanipissä vaikuttava viivakuormitus on kalanterin kalante-

roitavaan rainaan kohdistava suurin kuormitus. Kalanteri on mitoitettava alimman nipin kuormmituskyvyn mukaan, jolloin huomattava osa ylempien nippien kalanterointipotentiaalista jää käyttämättä. Myös telojen laakeripesien ja niihin kiinnitettyjen apulaitteiden massat aiheuttavat nippien viivapainejakaumiin vääristymiä etenkin nippien päissä, mikä heikentää kalanterointijälkeä.

Yksi nippikuormituksen tasaamiseksi kehitetty ratkaisu on ns. tasataipumakalanteri, joissa välitelojen massat eivät oleellisesti vaikuta nippien viivakuormituksen suuruuteen. Tasataipumakalantereissa välitelaston telat varustetaan kevennyslaitteilla, kuten hydraulisilla kevennyssylintereillä tai kalanterin runkoon nivelöidyillä vivuilla, joilla välitelojen ja niihin liittyvien apulaitteiden massojen aiheuttamaa viivakuormitusta voidaan keventää, jolloin nippejä kuormitetaan pääasiassa taipumakompensoiduilla ylä- ja alateloilla tai niihin kohdistuvalla ulkoisella kuormituksella. Välitelojen viivakuormitusta kevennettäessä otetaan huomioon kunkin telan taivutusjäykkyys, massa, muoto ja materiaaliominaisuudet. Väliteloihin kohdistettavia tukivoimia muutetaan kevennyslaitteilla niin, että telasto on tasapainotilassa ja halutussa taipumatilassa. Tasataipumakalantereita on kuvattu mm. julkaisussa US 5 438 920.

Tämän keksinnön tarkoituksena on saada aikaan aivan uudentyyppinen kalanteri, jossa telojen massasta nippeihin aiheutuvia viivakuormituksia voidaan keventää.

Keksintö perustuu siihen, että nipin muodostavien päällekkäisten telojen kantaosien väliin laitetaan voimaelimet, kuten jouset tai hydraulisylinterit, joilla nippien viivakuormitusta voidaan keventää. Tilan salliessa voimaelimet

voidaan myös sijoittaa nipin muodostavien päällekkäisten telojen laakeripesien väliin. Hydraulisylinterin sylinteriosa ja hydraulinestekanavat voidaan tarvittaessa koneistaa laakeripesien tai kantaosien sisään.

Keksinnön avulla saavutetaan huomattavia etuja.

Keksinnön mukaisessa kalanterissa nippien viivakuormitusta voidaan keventää, jolloin ylempien nippien kalanteroitavaan rainaan kohdistamaa kuormitusta voidaan lisätä, mikä lisää kalanterointikapasiteettia ja parantaa kalanterointijälkeä. Keksinnön mukainen kalanteri on rakenteeltaan yksinkertainen. Siinä ei esimerkiksi tarvita lainkaan telojen paikoitukseen käytettäviä karoja ja karamuttereita, koska telat on erotettu toisistaan voimaelinten avulla siten, että telat ovat pika-avausraon päässä toisistaan telaston ollessa kuormittamaton. Nippien kuormitusta voidaan keventää yksilöllisesti, jolloin kalanteroitava raina voidaan tehdä toispuoliseksi kuormittamalla esimerkiksi kääntönipin ylä- ja alapuolista telastoa erisuuruisilla kuormilla. Lisäksi monet olemassaolevat kalanterit ovat helposti ja edullisesti modernisoitavissa keksinnön mukaiseksi kalanteriksi.

Täsmällisemmin sanottuna keksinnön mukaiselle kalanterille on tunnusomaista se, mikä on esitetty patenttivaatimuksen 1 tunnusmerkkiosassa.

Keksinnön mukaiselle kalanteroíntimenetelmälle puolestaan on tunnusomaista se, mikä on esitetty patenttivaatimuksen 8 tunnusmerkkiosassa.

Keksintöä kuvataan seuraavassa tarkemmin oheisten piirustusten avulla.

Kuvio 1 esittää kaaviollisesti yhtä keksinnön mukaista kalanteria.

Kuvio 2 esittää kaaviollisesti toista keksinnön mukaista kalanteria.

Kuvion 1 kalanteri käsittää taipumakompensoidun ylätelan 1 ja taipumakompensoidun alatelan 2, joiden väliin on sovitettu välitelaston väliteloja 3. Väliteloja 3 on ainakin yksi. Telat 1, 2, 3 on kiinnitetty laakeripesiin 4, jotka on edelleen kiinnitetty kantaosiin 5. Kantaosat 5 on liukuvasti kiinnitetty kalanterin rungon 6 johteisiin 7. Telastoa liikutetaan ja telojen 1, 2, 3 välisten nippien kuomitusta säädellään ylä- 1 ja alatelaan 2 vaikuttavien, esimerkiksi kalanterin runkoon 6 kiinnitettyjen kuormitussylintereiden 8 avulla. Kalanteroitaessa raina kulkee päällekkäisten telojen muodostamien nippien läpi.

Nipin muodostavien päällekkäisten telojen kantaosien 5 väliin on sijoitettu voimaeliminä toimivat jouset 9, esimerkiksi lautasjousipakat, joilla telojen ja niihin liittyvien apulaitteiden massasta nippeihin aiheutuvaa viivakuormitusta voidaan keventää. Tilan salliessa jouset 9 voidaan sijoittaa myös nipin muodostavien päällekkäisten telojen laakeripesien 4 väliin. Jos telojen ja niihin liittyvien apulaitteiden massasta nippeihin aiheutuva viivakuormitus halutaan poistaa kokonaan, on jouset 9 mitoitettava siten, että niiden jousivakio ja pituus tai samassa pakassa olevien lautasjousien lukumäärä on sellainen, että kunkin kantaosan 5 ja/tai laakeripesän 4 väliin sijoittu jousisysteemi 9 kannattaa yläpuolellaan olevien telojen ja niihin liittyvien apulaitteiden massan. Tällöin jousivakio on suurin

alimman nipin muodostavien telojen 2, 3 kantaosien 5 välissä olevalla jousisysteemillä ja pienin ylimmän nipin muodostavien telojen 1, 3 kantaosien 5 väliin sijoitetulla jousisysteemillä. Kun teloja 1, 2, 3 ei kuormiteta kuormitussylintereillä 8, jouset 9 pitävät telat 1, 2, 3 pika-avausraon päässä toisistaan. Lisäksi jousissa 9 täytyy olla sisäänjoustoa, jotta ne eivät pohjaa telastoa kuormitettaessa.

Jotta kuormitus nipeissä olisi mahdollisimman tasaista, on jouset 9 mitoitettava siten, että kaikki nipit sulkeutuvat samanaikaisesti niitä kuormitettaessa. Tällöin ylempien nippien muodostavien telojen kantaosien 5 välissä olevissa jousissa 9, joissa jousivakio on pienempi, on oltava pitempi liikematka. Vaihtoehtoisesti voidaan käyttää progressiivisia jousia, joiden jousivakio muuttuu liikematkan funktiona.

Kalanterin nippien pika-avaus suoritetaan poistamalla kuormitussylintereiden 8 aiheuttama kuormitus, jolloin kantaosien 5 väliin sijoitetut jouset 9 erottavat telat 1, 2, 3 toisistaan. Pika-avausrakojen suuruutta voidaan muuttaa esimerkikisi jousipakassa olevien lautasjousten lukumäärää muuttamalla.

Kuviossa 2 nipin muodostavien telojen kantaosien 5 väliin sijoitettavina voimaeliminä käytetään jousien 9 sijasta erillisiä hydraulisylintereitä 19. Kalanterin pika-avausrakojen suuruutta ja nippien kuormitusta voidaan hydraulisylintereillä 19 muuttaa hydraulinesteen painetta muuttamalla. Muuten kuvion 2 sovellusmuoto on periaatteeltaan samanlainen kuviossa 1 esitetyn sovellusmuodon kanssa. Myös hydraulisylinterit 19 voidaan tilan salliessa sijoit-

taa nipin muodostavien päällekkäisten telojen 1, 2, 3 laakeripesien 4 väliin. Hydraulisylinterin 19 sylinteriosa ja tarvittavat hydraulinestekanavat voidaan tilan säästämiseksi koneistaa suoraan kantaosiin 5 tai laakeripesiin 4.

Keksinnöllä on myös edellä kuvatusta poikkeavia sovellusmuotoja.

Tarvittaessa joidenkin nippien kuormitusta voidaan keventää enemmän kuin muiden, jolloin telojen 1, 2, 3 taipumien sallimissa rajoissa voidaan vaikuttaa kalanteroitavan rainan toispuoleisuuteen.

Ylä- 1 ja/tai alatela 2 voidaan kiinnittää johteisiin 7 kantaosien sijasta laakeripesistään 4. Kalanterin ylä- 1 tai alatela 2 voi olla kiinteästi kiinnitetty kantaosistaan 5 tai laakeripesistään 4 kalanterin runkoon 6 tai johteisiin 7. Tällöin kiinteän telan 1, 2 yhteydessä ei tarvita kuormitussylintereitä 8, vaan telastoa kuormitetaan ainoastaan johteita 7 pitkin liikkuvan telan 1, 2 kuormitussylintereillä 8.

Patenttivaatimukset:

1. Kalanteri paperi- tai kartonkirainan kalanteroimiseksi, joka kalanteri käsittää

   - taipumakompensoidut ylä- (1) ja alatelan (2),

   - ainakin yhden ylä- (1) ja alatelan (2) väliin sovitetun välitelaston välitelan (3), jolloin päällekkäiset telat (1, 2, 3) on kalanteroitaessa sovitettu nippikosketukseen, ja

   - ripustuselimet (4, 5) telojen (1, 2, 3) kiinnitämiseksi kalanterin runkoon (6) tai rungon (6) johteisiin (7),

   tunnettu nipin muodostavien päällekkäisten telojen (1, 2, 3) kantaosien (5) ja/tai laakeripesien (4) väliin sovitetuista voimaelimistä (9, 19) välitelojen (3) ja niihin liittyvien apulaitteiden massasta aiheutuvan nippikuormituksen keventämiseksi.

2. Patenttivaatimuksen 1 mukainen kalanteri, tunnettu siitä, että voimaelin on jousi (9).

3. Patenttivaatimuksen 1 tai 2 mukainen kalanteri, tunnettu siitä, että voimaelin on hydraulisylinteri (19).

4. Jonkin patenttivaatimuksen 1-3 mukainen kalanteri, tunnettu siitä, että voimaelimet on sovitettu nipin muodostavien päällekkäisten telojen (1, 2, 3) kantaosien (5) väliin.

5. Jonkin patenttivaatimuksen 1-4 mukainen kalanteri, tunnettu siitä, että voimaelimet on sovitettu nipin muodostavien päällekkäisten telojen (1, 2, 3) laakeripesien (4) väliin.

6. Patenttivaatimuksen 3 mukainen kalanteri, tunnettu siitä, että kantaosa (5) käsittää hydraulisylinterin (19) sylinteriosan ja hydraulinestekanavat.

7. Patenttivaatimuksen 3 tai 6 mukainen kalanteri, tunnettu siitä, että laakeripesä (4) käsittää hydraulisylinterin (19) sylinteriosan ja hydraulinestekanavat.

8. Menetelmä paperi- tai kartonkirainan kalanteroimiseksi, jossa menetelmässä

- viedään kalanteroitava raina taipumakompensoidun ylätelan (1) ja taipumakompensoidun alatelan (2) sekä ainakin yhden näiden väliin sovitetun välitelaston välitelan (3) muodostamien nippien läpi,

tunnettu siitä, että

- kevennetään välitelojen (3) ja niihin liittyvien apulaitteiden massasta aiheutuvaa nippikuormitusta nipin muodostavien päällekkäisten telojen (1, 2, 3) kantaosien (5) ja/tai laakeripesien (4) väliin sovitetuilla voimaelimillä (9, 19).

9. Patenttivaatimuksen 8 mukainen menetelmä, tunnettu siitä, että voimaelimillä (9, 19) kevennetään välitelojon (3) ja niihin liittyvien apulaitteiden massasta aiheutuva nippikuormitus ainakin likimain kokonaan.

(57) Tiivistelmä:

Tämän keksinnön kohteena on kalanteri paperi- tai kartonkirainan kalanteroimiseksi, joka kalanteri käsittää taipumakompensoidut ylä- (1) ja alatelan (2), ainakin yhden ylä- (1) ja alatelan (2) väliin sovitetun välitelaston välitelan (3), jolloin päällekkäiset telat (1, 2, 3) on kalanteroitaessa sovitettu nippikosketukseen, ja ripustuselimet (4, 5) telojen (1, 2, 3) kiinnitämiseksi kalanterin runkoon (6) tai rungon (6) johteisiin (7). Nipin muodostavien päällekkäisten telojen (1, 2, 3) kantaosien (5) ja/tai laakeripesien (4) väliin on sovitettu voimaelimet (9, 19) välitelojen (3) ja niihin liittyvien apulaitteiden massasta aiheutuvan nippikuormituksen keventämiseksi.

(Kuvio 1)

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21G 1/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5438920 A (PEKKA KOIVUKUNNAS ET AL), 8 August 1995 (08.08.95) --	1,3-9
X	DE 1150272 B (J.M. VOITH G.M.B.H.), 12 June 1963 (12.06.63) --	1,2,8,9
A	EP 0242783 A2 (ALICH, GÜNTHER), 28 October 1987 (28.10.87) -- --------	1-9

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan Carlerud/ELY Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5438920 A	08/08/95	AT 170943 T	15/09/98
		CA 2154479 A	01/06/95
		DE 69413202 D,T	04/03/99
		EP 0679204 A,B	02/11/95
		SE 0679204 T3	
		EP 0848107 A	17/06/98
		EP 0848108 A	17/06/98
		FI 96334 B,C	29/02/96
		FI 935214 A	30/06/95
		JP 8506392 T	09/07/96
		WO 9514813 A	01/06/95
DE 1150272 B	12/06/63	NONE	
EP 0242783 A2	28/10/87	CH 669917 A	28/04/89
		DE 3765289 D	00/00/00
		CH 670777 A	14/07/89
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		IT 8720980 D	00/00/00
		US 4817407 A	04/04/89

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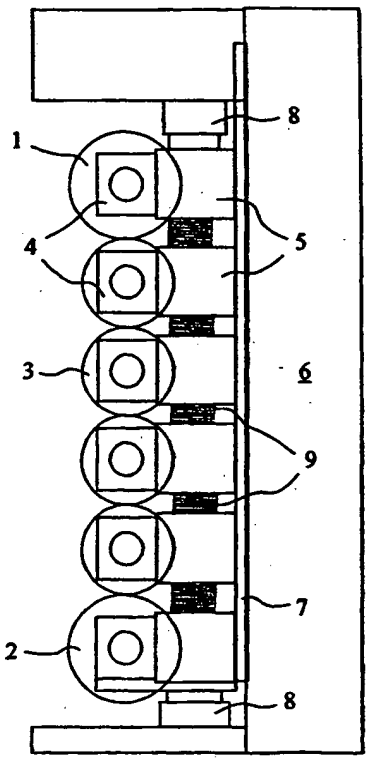
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CALENDER



(57) Abstract: The present invention relates to a calender for calendering a moving web of paper or board, the calender comprising a top roll (1) and a bottom roll (2), both of the rolls being of the variable-crown type, at least one intermediate roll (3) of an intermediate roll stack adapted between the top roll (1) and the bottom roll (2) in a disposition allowing the superimposed rolls (1, 2, 3) of the stack to be brought into a nip contact with each other during calendering, and support means (4, 5) for mounting the rolls (1, 2, 3) to the frame (6) of the calender or, alternatively, to guides (7) mounted on the frame (6). Actuator means (9, 19) are adapted between the mounts (5) of the superimposed rolls (1, 2, 3) forming the nips and/or between the bearing blocks (4) of the rolls so as to accomplish the relief of nip loading imposed by the weight of the intermediate rolls (3) and the auxiliary means connected thereto.

WO 01/23667 A1

Calender

The present invention relates to a calender according to the preamble of claim 1 and a calendering method according to the preamble of claim 8.

Conventionally, the surface of a moving web of paper or board is smoothed and made glossy in a multiroll calender comprising a plurality of rolls stacked in a calender frame so as to form a nip contact with each other. The roll stack comprises a top roll and a bottom roll with at least one intermediate roll located therebetween. The rolls of the stack are compressed against each other by the top and bottom rolls that act as the loading rolls or, simply, by the bottom roll to provide a sufficiently high linear nip force. In calendering, the web passes through the calender nips formed by the superimposed rolls.

The rolls of the calender stack are mounted rotatably in bearing blocks that are usually attached to roll mounts. The roll mounts themselves are slidably connected to vertical guides adapted to the calender frame. In a conventional supercalender, the roll mounts are additionally connected to vertical screw jack assemblies adapted to the calender frame. When the roll stack is open, the positioning of the roll mounts in the vertical direction is accomplished by means of the jack assemblies comprising threaded screw rods and nuts running thereon. As each one of the mounts of the roll bearings rest on these jack nuts, the entire weight of the set of rolls is supported on the screw rods when the roll stack is

unloaded. Bearing blocks of roll stack and thereby the rolls mounted thereon can be moved vertically in regard to the mounts.

The roll set of a multiroll calender has a plurality of rolls in a superimposed disposition, whereby the linear load imposed on the nips by the weights of the rolls increases nip-by-nip from the top nip to bottom nip, whereby the linear load in the bottom nip is the maximum stress imposed by the calender on the web passing the calender. Hence, the calender must be designed based on the load-bearing ability of the bottom nip, whereby a substantial portion of the potential calendering capacity of the upper nips remains unused. Also the weights of the roll bearing blocks and auxiliary devices connected thereto cause distortion in the linear pressure profiles of the nips, particularly at the nip ends, thus deteriorating the quality of the calendered web.

One technique developed for equalizing the nip loading is the so-called variable-crown calender, wherein the weights of the intermediate rolls do not essentially contribute to the linear load in the nips. In calenders equipped with variable-crown roll, the intermediate rolls of the stack are provided with load-relieving devices such as hydraulic load-relief cylinders or pivotal links connected to the calender frame, by means of which arrangements the linear load imposed by the intermediate rolls and auxiliary devices connected thereto can be relieved, thus allowing the nips to be loaded mainly by the variable-crown top and bottom rolls or, alternatively, an external load imposed on said rolls. In a load-relief

system for the intermediate rolls, the design factors to be taken into account are the deflection stiffness, mass, shape and material properties of each roll. The support forces to be imposed on the intermediate rolls are varied with the help of the load-relief means so that the roll set is equilibrated and brought to a desired state of crowning. Variable-crown calenders are described, among other things, in US Pat. No. 5,438,920.

It is an object of the present invention to provide an entirely novel type of calender construction capable of relieving the linear loads imposed on the calender nips by the weights of the roll masses.

The goal of the invention is achieved by way of disposing actuator means such as springs or hydraulic cylinders between the mounts of each superimposed pair of rolls so as to relieve the linear load of the nips. Within the constraints of available space, the actuator means may also be placed between the bearing blocks of two superimposed rolls forming a nip. If so needed, the cylinder portion of the hydraulic cylinder and the hydraulic fluid channels may be machined into the interior of the bearing blocks or their mounts.

The invention offers significant benefits.

In a calender according to the invention, the linear load of the nips may be relieved, whereby the loading imposed by the upper nips on the web can be increased, thus achieving a higher calendering capacity and improved quality of web calendering. A calender implemented ac-

cording to the invention has a simple construction. For instance, it needs no threaded screws and nuts conventionally used in the position adjustment jacks of rolls inasmuch the rolls are separated from each other with the help of actuator means so that the rolls are displaced apart from each other by the distance of the quick-opening gap when the roll stack is unloaded. As the loading of nips can be relieved individually, the web being calendered can be treated single-sidedly by loading, e.g., the top and bottom rolls of a reversing nip by unequal forces. Furthermore, existing calenders can be readily and cost-efficiently modernized into a calender according to the invention.

More specifically, the calender according to the invention is characterized by what is stated in the characterizing part of claim 1.

Furthermore, the calendering method according to the invention is characterized by what is stated in the characterizing part of claim 8.

In the following, the invention will be examined in more detail by making reference to the appended drawings.

FIG. 1 shows diagrammatically a calender according to the invention.

FIG. 2 shows diagrammatically another calender according to the invention.

Referring to FIG. 1, the calender construction shown

therein comprises a top roll 1 and a variable-crown bottom roll 2 having therebetween adapted intermediate rolls 3 of an intermediate roll set. The number of the intermediate rolls 3 is at least one. The rolls 1, 2, 3 are mounted on bearing blocks 4 that are further connected to mounts 5. The mounts 5 are slidably connected to guides 7 adapted on the calender frame 6. The roll set is moved and the load pressures of the nips formed between the rolls 1, 2, 3 is adjusted with the help of actuators such as loading cylinders 8 adapted to the calender frame 6 so as to impose the loading forces on the top roll 1 and the bottom roll 2. During calendering, the web passes the nips formed by the superimposed rolls.

Between the mounts 5 of the rolls forming the nip between two superimposed rolls, there are provided springs 9 such as a stack of cup springs, acting as actuators so as to relieve the linear loading of the nips caused by the weights of the rolls and the auxiliary devices connected thereto. Provided that a sufficient operating space is available, the springs 9 may alternatively be placed between the bearing blocks 4 of superimposed rolls forming a nip. If a complete elimination of the linear loading caused by the rolls and their auxiliary devices on the nips is desirable, the springs 9 must be dimensioned so that their spring constant and length or, alternatively, the number of cup springs in a single stack of cup springs is selected such that the spring system 9 adapted between each mount 5 and/or bearing block 4 can support the weight of its overlying rolls and their auxiliary devices. Then, the spring constants are selected such that the spring system located between the

mounts 5 of rolls 2, 3 forming the bottom nip has the highest spring constant, while the spring system located between the mounts 5 of rolls 1, 3 forming the top nip is selected to have the lowest spring constant. When the rolls 1, 2, 3 are not loaded by the loading cylinders 8, the springs 9 keep the rolls 1, 2, 3 separated at a distance of the quick-opening gap from each other. Additionally, the springs 9 must have some degree of overcompressibility to prevent them from bottoming during the loading of the roll set.

To keep the loading of the nips maximally equal, the springs 9 must be dimensioned so as to make all the nips to close simultaneously when loading is applied on the nips. Hence, the springs 9 of a smaller spring constant placed between the mounts 5 of the rolls forming the upper nips must respectively have a longer working travel. Alternatively, the system can be constructed using progressive springs in which the spring constant changes with the travel.

The quick-opening of the calender nips is accomplished by way of removing the loading imposed by the loading cylinders 8, whereby the springs 9 placed between the mounts 5 can separate the rolls 1, 2, 3 apart from each other. The gap width of the quick-opened nips can be changed by, e.g., varying the number of cup springs in the assembled spring stack.

In the embodiment of FIG. 2, there are no springs 9 located between the mounts 5 of the rolls forming a nip, but rather, hydraulic cylinders 19 are used as the actua-

tor means. Herein, the gap width of the quick-opened nips and the nip loading forces can be adjusted with the help of the hydraulic cylinders 19 by means of changing the pressure of the hydraulic fluid. Otherwise the embodiment of FIG. 2 is basically identical to that shown in FIG. 1. Also the hydraulic cylinders 19 may be located, within the space constraints, between the bearing blocks 4 of superimposed rolls 1, 2, 3 forming a nip. To save space, the cylinder portion of the hydraulic cylinder 19 and the hydraulic fluid channels communicating therewith may be machined directly into the interior of the mounts 5 or the bearing blocks 4.

In addition to those described above, the invention may have alternative embodiments.

When necessary, the loading of certain nips may be relieved by a greater amount than the loading of certain others, whereby it is possible within the constraints of the allowable deflections of rolls 1, 2, 3 to affect the degree of single-sidedness of the calendered web.

The top roll 1 and/or the bottom roll 2 may be connected by their bearing blocks 4 to the guides 7, rather than by their mounts as taught above. The top roll 1 or the bottom roll 2 of the calender can be solidly connected by its mounts 5 or bearing blocks 4 to the calender frame 6 or its guides 7. In this arrangement, the fixed rolls 1, 2 need not be provided with loading cylinders 8, but rather, the entire roll set of the stack can be simply loaded with the help of the loading cylinders 8 acting on the other roll 1, 2 adapted movable along the guides 7.

What is claimed is:

1. Calender for calendering a web of paper or board, the calender comprising

- a top roll (1) and a bottom roll (2), both of the rolls being of the variable-crown type,

- at least one intermediate roll (3) of an intermediate roll stack adapted between said top roll (1) and said bottom roll (2) in a disposition allowing the superimposed rolls (1, 2, 3) of the stack to be brought into a nip contact with each other during calendering, and

- support means (4, 5) for mounting said rolls (1, 2, 3) to the frame (6) of the calender or to guides (7) mounted on said frame (6),

c h a r a c t e r i z e d by actuator means (9, 19) adapted between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips and/or between the bearing blocks (4) of said rolls so as to accomplish the relief of nip loading imposed by the weight of said intermediate rolls (3) and the auxiliary means connected thereto.

2. Calender according to claim 1, c h a r a c t e r - i z e d in that said actuator means is a spring (9).

3. Calender according to claim 1 or 2, c h a r a c -

t e r i z e d in that said actuator means is a hydraulic cylinder (19).

4. Calender according to any one of foregoing claims 1-3, c h a r a c t e r i z e d in that said actuator means are adapted to function between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips.

5. Calender according to any one of foregoing claims 1-4, c h a r a c t e r i z e d in that said actuator means are adapted to function between the bearing blocks (4) of said superimposed rolls (1, 2, 3) forming said nips.

6. Calender according to claim 3, c h a r a c t e r - i z e d in that said mount (5) includes the cylinder portion of said hydraulic cylinder (19) with the hydraulic channels thereof.

7. Calender according to claim 3 or 6, c h a r a c - t e r i z e d in that said bearing block (4) includes the cylinder portion of said hydraulic cylinder (19) with the hydraulic channels thereof.

8. Method for calendering a web of paper or board, the method comprising the steps of

- passing the web to be calendered via nips formed by a variable-crown top roll (1) and a variable-crown bottom roll (2), as well as at least one intermediate roll (3) of an inter-

mediate roll set placed between said rolls,

c h a r a c t e r i z e d in that

- the nip loading imposed by the weight of said intermediate rolls (3) and the auxiliary means connected thereto is relieved by actuator means (9, 19) adapted between the mounts (5) of said superimposed rolls (1, 2, 3) forming said nips and/or between the bearing blocks (4) of said rolls.

9. Method according to claim 8, c h a r a c t e r - i z e d in that said actuator means (9, 19) serve to accomplish an at least essentially complete relief of the nip loading imposed by the weight of said intermediate rolls (3) and auxiliary devices connected thereto.

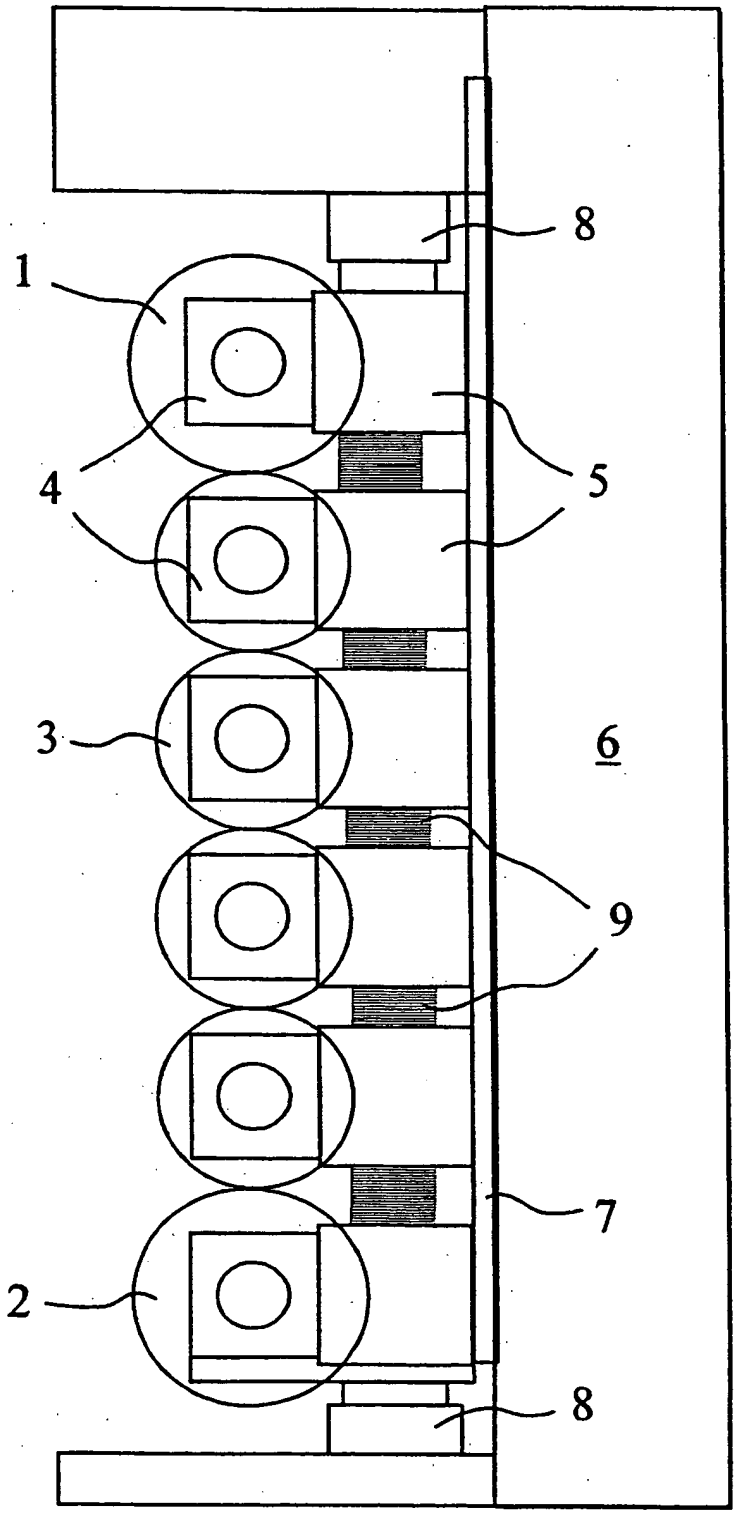


Fig. 1

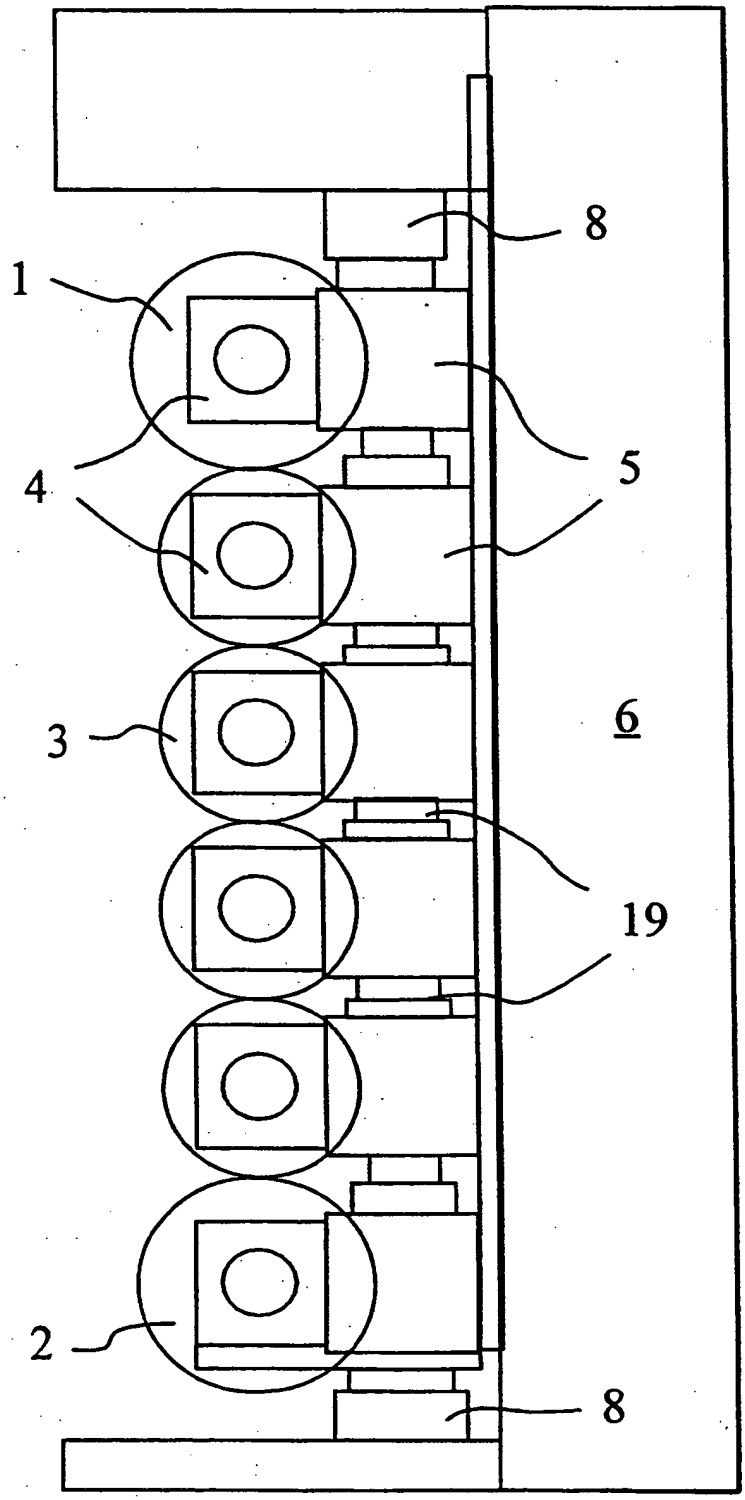


Fig. 2

INTERNATION SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21G 1/00
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan Carlerud/ELY Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5438920 A	08/08/95	AT 170943 T	15/09/98
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		EP 0848108 A	17/06/98
		FI 96334 B,C	29/02/96
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		JP 8506392 T	09/07/96
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		CH 670777 A	14/07/89
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		IT 8720980 D	00/00/00
		US 4817407 A	04/04/89